

This listing of claims will replace all prior versions and listings of the claims in the application.

In the Claims:

1. (Currently Amended) A system for sound cancellation comprising:
a source microphone for detecting sound propagating from a sound source;
a speaker ~~for broadcasting~~ configured to direct a canceling sound ~~with respect to~~
toward a cancellation location that is spatially remote from the sound source, and
a computational module in communication with the microphone and the speaker, the
computational module configured to receive a signal from the microphone, identify a
cancellation signal using a predetermined adaptive filtering function responsive to an acoustic
environment of the cancellation location, and transmit a cancellation signal to the speaker.
2. (Original) The system of Claim 1, further comprising a training sub-
system having at least one training microphone that can be placed at the cancellation location.
3. (Original) The system of Claim 1, further comprising a temperature sensor
in communication with the computational module, wherein the predetermined adaptive
filtering function is responsive to the temperature of the acoustic environment.
4. (Original) The system of Claim 2, wherein the predetermined adaptive
filtering function is determined by receiving a first sound input from the source microphone,
receiving a second sound input from the training microphone, and then determining the
adaptive filtering function, wherein the predetermined adaptive filtering function is adaptive
to a sound transformation between the source microphone signal and the training microphone
signal.

5. (Original) The system of Claim 1, wherein the predetermined adaptive filtering function comprises a function that identifies a sound transformation between the source microphone and the cancellation location without contemporaneous sound input at the cancellation location.

6. (Original) The system of Claim 4, wherein the cancellation location is spatially removed from the source microphone and speaker.

7. (Original) The system in Claim 1, wherein the source microphone comprises a plurality of source microphones.

8. (Original) The system of Claim 1, further comprising at least one locating sensor.

9. (Original) The system of Claim 8, wherein the locating sensor is configured to determine a location of a subject.

10. (Original) The system of Claim 9, wherein the predetermined adaptive filtering function determines an approximate sound transformation as a function of the location of the subject.

11. (Original) The system of Claim 8, wherein the locating sensor is configured to determine a location of a sound source.

12. (Original) The system of Claim 11, wherein the adaptive filtering function determines an approximate sound transformation at a cancellation location based on the location of the sound source.

13. (Original) The system of Claim 8, further comprising at least one locating sensor configured to determine a location of a sound source, wherein the adaptive filtering function comprises a function that determines an approximate sound transformation at the location of the subject based on the location of the sound source.

14. (Original) The system of Claim 1, wherein the speaker is a parametric speaker for broadcasting ultrasonic sound, the parametric speaker configured to broadcast a localized cancellation sound at the cancellation location.

15. (Original) The system of Claim 1, wherein the speaker comprises a plurality of speakers.

16. (Currently Amended) The system of Claim 1, wherein the computational module further comprises a screening module that can analyze signals from the source microphone ~~for indications of~~ to determine if a change in respiratory sounds occurs sufficient to identify a health condition comprising at least one of: sleep apnea, pulmonary congestion, pulmonary edema, asthma, halted breathing, abnormal breathing, arousal, and disturbed sleep.

17. (Currently Amended) The system of Claim 16, wherein the computational module further comprises:

a communicating module configured such that, if the screening module detects a health condition, the communicating module communicates the detection of a health condition to a user, and

wherein the communicating module comprises at least one of: an optical display, an acoustic mechanism, an alphanumeric display, a wire, optical fiber, wireless, Internet, and removable memory storage.

18. (Currently Amended) A method of sound cancellation comprising:

detecting a sound input at an input location that is spatially remote from a sound source;

identifying a cancellation signal for the sound input with respect to a cancellation location that is spatially remote from the sound source using a predetermined adaptive filtering function; and

broadcasting a cancellation sound for canceling sound proximate the cancellation location in a direction toward the cancellation location.

19. (Original) The method of Claim 18, further comprising training an algorithm to provide the adaptive filtering function.

20. (Original) The method of Claim 19, wherein the training algorithm comprises the steps of:

detecting a first sound at a first location;

detecting a modified second sound at a second location, the modified second sound being a result of sound propagating from the first location to the second location; and

determining the adaptive filtering function, the adaptive filtering function approximating the second modified sound from the first sound.

21. (Original) The method of Claim 20, further comprising obtaining a second signal using a training system comprising at least one microphone, the training system being at least one of: head-wearable device and positionable at desired location of cancellation.

22. (Original) The method of Claim 21, further comprising providing a training device comprising a head surrogate comprising a three dimensional object and at least one microphone.

23. (Original) The method of Claim 18, further comprising analyzing the sound input for medical screening purposes.

24. (Original) A method for canceling sound, comprising:
detecting first sound at a first location;
detecting a modified second sound at a second location, the modified second sound being a result of sound propagating to the second location;
determining an adaptive filtering function, the adaptive filtering function approximating the second modified sound from the first sound;
halting detecting of the modified sound; and
determining a cancellation signal proximate the second location from the first sound and the adaptive filtering function.
25. (Currently Amended) A method for canceling sound, comprising:
detecting a first sound at a first location;
detecting a modified second sound at a second location, the modified second sound being a result of sound propagating to the second location; and
determining an adaptive filtering function, the adaptive filtering function approximating the second modified sound from the first sound without requiring additional sound input from the second location.
26. (Currently Amended) A method for analyzing sound for health conditions, comprising:
providing a microphone spatially remote from a subject;
analyzing a sound input to the microphone ~~for indications of~~ to determine if a change in respiratory sounds occurs sufficient to identify a health condition comprising at least one of: sleep apnea, pulmonary congestion, pulmonary edema, asthma, halted breathing, abnormal breathing, arousal, and disturbed sleep.
27. (Currently Amended) A system for sound cancellation comprising:
a source microphone for detecting sound; and

a parametric speaker configured to transmit a canceling sound configured to cancel the detected sound such that the canceling sound that is localized with respect to a cancellation location.

28. (Original) The system of Claim 27, wherein the parametric speaker produces the canceling sound with an interaction between two or more ultrasonic signals.

29. (Original) The system of Claim 27, wherein the parametric speaker produces the canceling sound by nonlinear interaction of an ultrasonic signal with air.

30. (Original) The system of Claim 27, further comprising:
a computational module in communication with the microphone and the parametric speaker, the computational module configured to receive a signal from the microphone, identify a cancellation signal using a predetermined adaptive filtering function responsive to an acoustic environment of the cancellation location; and transmit a cancellation signal for producing the canceling sound to the parametric speaker.

31. (Original) A method for canceling sound comprising:
detecting a sound; and
transmitting a canceling signal from a parametric speaker that locally cancels the sound with respect to a cancellation location.

32. (Original) The method of Claim 31, wherein transmitting a canceling signal further comprises transmitting a plurality of ultrasonic signals wherein the canceling signal is formed from the interaction of the plurality of ultrasonic signals.

33. (Original) The method of Claim 31, wherein the canceling signal is formed from a nonlinear interaction of an ultrasonic signal with air.

34. (Original) The method in Claim 31 wherein the canceling signal is formed from an interaction between a plurality of ultrasonic signals that creates a difference signal among the ultrasonic signals at the cancellation location.

35. (Original) The method in Claim 31 wherein the ultrasonic signal comprises a carrier frequency component and a modulation component and nonlinear interaction between the carrier frequency component and the modulation component in air creates a cancellation sound by demodulation of the ultrasonic signal that is in a generally audible frequency range along the propagation path of the ultrasonic signal.

36. (Original) The method of Claim 31, further comprising:
determining an adaptive filtering function, the adaptive filtering function approximating the sound propagation to the cancellation location; and
identifying the canceling signal by applying the adaptive filtering function to the detected sound.

37. (New) The system of Claim 1, wherein the sound source comprises a snoring individual and the speaker is not wearable by the snoring individual.

38. (New) The system of Claim 1, wherein the predetermined adapted filtering function includes a situational transfer matrix function, \mathbf{W} ,

$$\mathbf{W} = 1/(\mathbf{d}-\mathbf{c}*\mathbf{e})$$

wherein \mathbf{c} is a transfer function for sound propagation from the sound source to the source microphone, \mathbf{e} is a transfer function for sound propagation from the speaker to the cancellation location, and \mathbf{d} is a transfer function for sound propagation from the source microphone to the speaker, and the $*$ operator denotes mathematical convolution.